INTRODUCTION

Blue rockfish (*Sebastes mystinus*) range from the Gulf of Alaska to northern Baja California, although they are most commonly found between Oregon and central California (Love et al. 2002). This assessment focuses on the stock from the Oregon border to Point Conception, California (Figure 1). They inhabit kelp forests and rocky reefs in relatively shallow depths usually to about 90 meters (50 fathoms) (Miller and Lea 1972, Reilly 2001), but have been landed as deep as 549 meters (300 fathoms) (Love et al. 2002). Blue rockfish are residential, with their movements restricted to a small area, usually near the kelp canopy or pinnacles for shelter and spatial orientation (Miller and Geibel 1973, Lea et al. 1999, Jorgensen et al. 2006). Genetic evidence suggests distinct subpopulations of blue rockfish with a biogeographic barrier at Cape Mendocino, California (Cope 2004). More recently, evidence suggests the presence of two genetically distinct species in central California (Petersen et al. in review).

Blue rockfish are primarily "selective opportunity" planktivores (Gotshall et al. 1965, Love and Ebeling 1978). As juveniles, they feed on planktonic crustacea, hydroids, and algae (Miller and Geibel 1973). Adults also consume fish, squid, tunicates, scyphozoids, bull kelp nori, and pelagic gastropods (Hobson et al. 1996, Lea et al. 1999, Love et al. 2002). Many of these prey items are made available from the relaxation of upwelling or southerly winds, explaining high blue rockfish numbers in the summer off central and northern California, where these conditions are well developed (Hobson and Chess 1988, Love et al. 2002).

Blue rockfish have been an important part of the recreational fishery in California since the late 1950s (Reilly et al. 1993, Wilson-Vandenberg et al. 1996, Mason 1998). Commonly taken by Commercial Passenger Fishing Vessels (CPFVs, aka partyboats), skiffs, and divers, it is among the most frequently caught species north of Point Conception (Karpov et al. 1995). However, since the mid-1980s the California recreational catch has declined significantly, especially in the south (Figure 2). This may be a result of overfishing from the more heavily populated southern coast (Love et al. 1998), where there is more angling opportunity due to more favorable access and ocean conditions (Bennett et al. 2004); poor recruitment resulting from a long-term shift away from preferred cold, productive waters (Love et al. 2002, Jarvis et al. 2004); or the effect of increasingly strict fishing regulations.

The California blue rockfish catch has played a relatively minor role in the commercial fishery compared to the recreational fishery. This has remained true, even with the advent of the live-fish fishery in the late 1980s (Figure 3), although the contribution of blue rockfish has been increasing in recent years. Since the preferred dinner plate-sized catch for this fishery results in immature fish being targeted in many cases, there is concern over the potential implications of the increasing effort in this fishery. Selection of younger, smaller individuals has led to lower lifetime egg production and consequently, threatened population viability (O'Farrell and Botsford 2005, O'Farrell and Botsford 2006). Due to their great abundance in kelp forests, blue rockfish juveniles are recognized as a key species in the piscivore trophic web of these

ecosystems (Hallacher and Roberts 1985). Careful monitoring of blue rockfish populations, and of the factors impacting them, is needed to maintain the species and the kelp forest ecosystems they inhabit.

This assessment focuses on the northern and central California population of blue rockfish (north of Point Conception, Figure 1) where blue rockfish are most commonly found and abundant. There has been a significant decrease in catch and effort in southern California, most likely due to unfavorable habitat associated with the warmer waters since the 1990s. Mason (1998) noted size reductions in CPFV catch as evidence of less successful recruitment during warmer years. A decrease in kelp abundance could be the main reason why blue rockfish have not been abundant in southern California in over 15 years. Kelp is an important habitat for both recruiting and adult blue rockfish, and can be adversely affected by increases in water temperature. Blue rockfish caught in southern California have mainly come from the Santa Barbara Channel region, and historically, kelp has been abundant in this region. Long-term data on southern California kelp beds have been collected by ISP Alginates (formerly Kelco Co.), and have been made available as database SBCLTER: Reef Historical Kelp Database for giant kelp (*Macrocystis pyrifera)* biomass in California and Mexico by the Santa Barbara Coastal Long Term Ecological Research Project (<http://metadata.nbii.gov/>). The database provided approximate monthly values of the area of 16 discrete persistent kelp beds between Ventura and Point Conception. The area of each bed is expressed as a fraction of its long-term mean, and the overall index (Figure 4) is the annual average of these standardized values.

Regulation History

Prior to the adoption of the Pacific Coast Groundfish Fishery Management Plan (FMP) in 1982, blue rockfish (*Sebastes mystinus*) were managed through a regulatory process that included the California Department of Fish and Game (CDFG) along with either the California State Legislature or the Fish and Game Commission (FGC) depending on the fishery and sector (recreational or commercial). With implementation of the Pacific Coast Groundfish FMP, blue rockfish came under the management authority of the Pacific Fishery Management Council (PFMC), being incorporated, along with all genera and species of the family Scorpaenidae, into a federal rockfish classification (PFMC 2004) and was then jointly managed with the state.

Under the Pacific Coast Groundfish FMP, groundfish species and species groups were managed using estimates of Allowable Biological Catch (ABC). Starting in 1992, some of the rockfish species and species groups also began to be managed using harvest guidelines followed in 1999 by the use of Optimum Yields (OY). To keep landings within these adopted harvest targets, the Pacific Coast Groundfish FMP provided the Council with a variety of management tools including area closures, season closures, gear restrictions, and, for the commercial sector, cumulative limits (generally for two-month periods). With the implementation of a federal groundfish restricted access program in 1994, allocations of total catch and cumulative limits began to be specifically set for open

access (including most of California's commercial fisheries that target nearshore rockfish) and limited entry fisheries (PFMC 2002; 2004).

During most of this time frame, management also concentrated on the commercial groundfish sector primarily because harvest from the recreational sector was considerably smaller than that from the commercial sector. This approach began to change in the later 1990's as commercial landings decreased and recreational harvest became a greater proportion of the available harvest.

The PFMC's rockfish management structure changed significantly in 2000 with the replacement of the *Sebastes* complex –north and –south areas with Minor Rockfish North (Vancouver, Columbia, and Eureka, International North Pacific Fisheries Commission (INPFC) areas) and Minor Rockfish South (Monterey and Conception INPFC areas only). The OY for these two groups was further divided (between north and south of 40º10' N. lat. ~ Cape Mendocino, Humboldt County, California) into nearshore, shelf, and slope rockfish categories with allocations set for Limited Entry and Open Access fisheries within each of these three categories (January 4, 2000, 65 FR 221; PFMC 2002, Tables 54-55). Species were parceled into these new categories depending on primary catch depths and geographical distribution.

Also, in 2000, seasonal 2-month closures were adopted in California for the first time for both commercial and recreational fisheries. In addition, the bag limit in California for rockfish was reduced from 15 to 10 rockfish, and recreational gear was limited to one line with three hooks.

Cowcod Conservation Areas (CCAs) were established in 2001 to reduce fishing effort for cowcod rockfish in southern California (PFMC 2002, Table 29). More importantly for blue rockfish management, Rockfish Conservation Areas (RCAs) were established in 2003 to allow for the closure of large areas based on depth for particular fishing sectors or gears. The trawl and non-trawl gear RCAs were two of these groundfish conservation areas established in 2003 with the purpose of reducing fishing effort on shelf and slope rockfish, including overfished species such as canary rockfish, while providing some limited bottom fishing opportunities in adjacent waters.

During the late 1990's and early 2000's, major changes also occurred in the way that California managed its nearshore fishery. The Marine Life Management Act (MLMA), which was enacted in 1999, gave authority to the FGC to regulate commercial and recreational nearshore fisheries through FMPs and provided broad authority to adopt regulations for the nearshore fishery during the time prior to adoption of a nearshore finfish FMP.

Following adoption of the Nearshore FMP in fall of 2002, the FGC adopted a nearshore restricted access program for the commercial fishery to be effective starting in the 2003 fishing year, including the establishment of a Deeper Nearshore Permit (DNP). Since blue rockfish were categorized in the Nearshore FMP as a deeper nearshore rockfish, commercial fishermen taking this species were required to possess a DNP.

Although the Nearshore FMP provided for the management of the nearshore rockfish, joint management authority for these species continued to reside with the Council and the State. Even so, for the 2003 and subsequent fishery seasons, the State provided recommendations to the Council specific to the nearshore species that followed the directives set out in the Nearshore FMP. These recommendations, which the Council incorporated into the 2003 management specifications, included a division of the Minor Rockfish North – Nearshore into two groups (black and blue rockfish; and other nearshore rockfish), recalculation and division of the OY for Minor Rockfish South - Nearshore into three groups (shallow nearshore rockfish; deeper nearshore rockfish; and California scorpionfish). The Council also incorporated specific harvest targets and recreational and commercial allocations for each of the above groups and adopted various management specifications to keep harvest within harvest targets.

Starting in 2004, management specifications adopted by the Council and State also included recreational RCAs which limited the maximum allowable fishing depth such as the California Rockfish Conservation Area (CRCA) (for more information on the CRCA, see Title 14 of the California Code of Regulations, Section 27.51). Also in 2004, black rockfish were removed from both the Minor Rockfish North and Minor Rockfish South ABCs and OYs. As a consequence, the groupings and harvest targets for the Minor Rockfish North – Nearshore changed; the blue rockfish proportion of the black and blue rockfish group harvest target was combined with that from the other nearshore rockfish and placed under a new group category, minor nearshore rockfish.

A timeline covering California regulations that applied to blue rockfish from 1990-2006 is provided in Table 1. Table 2 provides the commercial regulations and related gear changes from 1950-2006.